

REMARKS

In the present Amendment, claims 2 and 9 have been amended to delete “an alkoxysilane group” and “a halogenated silyl group” from the Markush group defining X. Also, claims 10 and 11 have been amended to correct an inadvertent error in naming of the chelating compound and polymerizing monomer. See pages 9 and 14.

No new matter has been added and entry of the Amendment is respectfully requested. Upon entry of the Amendment, claims 2-4 and 6-11 will be all the claims pending in the application.

In the Office Action dated March 25, 2004, claims 1-4 and 6-11 are rejected under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as being obvious over Li et al.

Applicants respectfully submit that the present claims are novel and patentable over Li et al for at least the following reasons. Claim 1 has been canceled.

1. The Present Invention Is Not Anticipated By Li et al

Li et al discloses that the coating composition may contain $F(CF_2)_gCH_2CH_2Si(CH_3)_hZ_{3-h}$ wherein Z is chloro, methoxy or ethoxy; a reactive group containing polymer, and $M(Y)_p$ wherein M is a metal selected from the group consisting of titanium, aluminum, zirconium, boron, tin, indium, antimony, and zinc, and Y is selected from the group consisting of C_1 - C_{10} alkoxy and acetylacetonato (col. 8, lines 47-55; col. 2, lines 53-59; and col. 6, lines 49-59).

As described above, Applicants have in the present Amendment amended independent claims 2 and 9 to delete “an alkoxysilane group” and “a halogenated silyl group” from the

Markush group for X, to thereby exclude Li's compound from the scope of the amended claims.

Li et al does not disclose a fluorine-containing compound containing a carboxyl group or a sulfonic acid group or a salt thereof, a hydroxy group, an epoxy group, a phosphoric group, an isocyanate group and a blocked isocyanate group, as recited in independent claims 2 and 9.

Because Li et al. fails to disclose each and every element of the present invention, Applicants respectfully submit that Li et al does not anticipate the present claims.

2. The Present Invention Is Not Obvious Over Li et al

First, Li et al does not suggest a fluorine-containing compound containing a carboxyl group or a sulfonic acid group or a salt thereof, a hydroxy group, an epoxy group, a phosphoric group, an isocyanate group and a blocked isocyanate group, as recited in the present invention. Furthermore, the Examiner has not cited anything in the prior art which would lead one of ordinary skill to select a fluorine-containing compound including reactive group X as defined in the amended claims, in combination with a metal alkoxide and a reactive group-containing polymer. For this reason alone, the present claims are not obvious over Li et al.

Second, the present invention provides an organic-inorganic hybrid material which imparts durability while maintaining sufficient water repellency, oil repellency, stain blocking property and soil releasability before and after cleaning (page 41, lines 2-6 of the specification).

As shown in Tables B and C at pages 39-40 of the specification, Comparative Examples 1, 3 and 5 (which did not contain a metal alkoxide component) and Comparative Examples 2, 4 and 6 (which did not contain a fluorine-containing compound having a functional group reactive with the metal alkoxide) provided (before cleaning) one or more of water repellency, oil repellency, SB and soil releasability properties inferior to those of Examples 1 to 6 of the

invention containing the organic-inorganic hybrid material. The effects of the invention, however, are remarkable when comparing the results after cleaning five times. Notably, the Comparative Examples lost almost all of their water repellency, oil repellency and soil releasability property.

Tables B and C of the specification are reproduced below.

Table B

		Example						Comparative Example					
		1	2	3	4	5	6	1	2	3	4	5	6
Inorganic component	TMSM	○	○	○	○	○	○	-	○	-	○	-	○
	TEOS	○	○	○	○	○	○	-	○	-	○	-	○
Organic component	PMA	○	○	○	○	○	○	○	-	○	-	○	-
	Fluorine-containing compound	○	○	○	○	○	○	○	-	○	-	○	-
	MMA	○	○	○	○	○	○	○	○	○	○	○	○
Crosslinking agent		○	○	-	-	-	-	○	○	-	-	-	-
Emulsifier		-	-	-	-	○	○	-	-	-	-	○	○

Table C

		Example						Comparative Example					
		1	2	3	4	5	6	1	2	3	4	5	6
Before cleaning	Water repellency	50	50	50	50	50	50	30	0	30	0	30	0
	Oil repellency	3	3	3	3	3	3	2	0	2	0	2	0
	SB property	10	10	10	10	10	10	10	3	10	3	10	3
	Soil releasability (%)	80	80	77	77	77	77	43	29	37	20	37	20
After cleaning (5 times cleaning)	Water repellency	50	50	50	50	50	50	0	0	0	0	0	0
	Oil repellency	3	3	3	3	3	3	0	0	0	0	0	0
	SB property	10	10	10	10	10	10	10	0	10	0	10	0
	Soil releasability (%)	77	77	74	74	74	74	14	0	14	0	14	0

	Fluorine residual ratio (%)	95	95	95	95	95	95	5	-	5	-	5	-
Knoop hardness		33	33	30	30	28	28	22	33	10	30	10	29

Therefore, although a surface treatment agent of the present invention could conceivably be prepared by picking and choosing from various optional components disclosed by Li et al, there is no teaching, suggestion or instruction to one of ordinary skill to make the specific combination of the present invention. Accordingly, Applicants respectfully submit that the present invention provides unexpectedly superior results to Li et al and therefore is patentable over Li et al.

In view of the foregoing, Applicants respectfully submit that the present invention is not anticipated or rendered obvious by Li et al and the rejection should be withdrawn.

3. Response to Advisory Action

In the Advisory Action dated August 16, 2004, the Examiner considered that the above comparative data are not commensurate in scope with the claims. Further, the Examiner questions the unobviousness of increased oil and water repellency when including a fluorosilane, stating that this is a property commonly associated with fluorinated groups.

In response, Applicants submit herewith a Declaration under 37 C.F.R. § 1.132 executed by Mr. Fumihiko Yamaguchi, a co-inventor of the present invention. Applicants respectfully submit that the results of record supplemented with the Declaration are in commensurate in scope with the present invention and establish the unexpected superiority of the present invention.

Specifically, Synthesis Examples 3-9 were prepared in the same manner as described in Synthesis Example 2 of the present specification, except for the following changes. As shown in Table A', as the inorganic component, titanium (IV) ethoxide (Synthesis Example 3), zirconium (IV) propoxide (Synthesis Example 4), methyltriethoxysilane and 3-methacryloxypropyl dimethylmethoxy silane (Synthesis Example 5) were used. As the organic component, perfluorooctanoic acid (Synthesis Example 6), perfluorooctane sulfonic acid (Synthesis Example 7), potassium perfluorooctanoate (Synthesis Example 8) and 3-(perfluorooctyl)-1,2-epoxypropane (Synthesis Example 9) were used. In addition, in Synthesis Examples 8 and 9, polyacrylic acid (PA) and ethyl methacrylate (EMA) were used in replace of polymethacrylix acid (PMA) and methyl methacrylate (MMA) in Synthesis Example 2, respectively.

By using new Synthesis Examples 3-9 contained in the Declaration, Preparative Examples 7-13 were prepared in the same manner as described in Preparative Example 1 of the present specification (Table B'). The treatment solution, Examples 7-13 were then prepared and evaluated in the same manner as described in Example 1 of the present specification. The results are summarized in Table C'.

As apparent from the results in Table C, Examples 7-13 demonstrate similar properties as Examples 1-6 described in the present specification.

Table A'

Additional Synthesis Examples 3 to 9

	Component (A)	Component (B)	Component (C)	Component (D)	Component (E)
Claims	metal alkoxide	Rf-X, X: group having reactive group -COOH, -SO ₃ H, COOM, -SO ₃ M, -OH, -CH(O)CH ₂ , -PO ₃ H, -NCO, -NHCO-B	Polymer having group reactive with substrate	Metal chelate compound	Polymer- izable monomer
Synthesis Example 1	TEOS [Si(OCH ₂ CH ₃) ₄]	CF ₃ (CF ₂) ₇ CH ₂ CH ₂ -Si(OCH ₂ CH ₃) ₃ (outside claims)	Polymethacrylic acid (PMA)	CH ₂ =CH(CH ₃)-C=O)O- (CH ₂) ₃ Si(OCH ₃) ₃	MMA
Synthesis Example 2	TEOS [Si(OCH ₂ CH ₃) ₄]	CF ₃ (CF ₂) ₇ CH ₂ CH ₂ -OH	Polymethacrylic acid (PMA)	CH ₂ =CH(CH ₃)-C=O)O- (CH ₂) ₃ Si(OCH ₃) ₃	MMA
Synthesis Example 3	Titanium (IV) ethoxide [Ti(OCH ₂ CH ₃) ₄]	CF ₃ (CF ₂) ₇ CH ₂ CH ₂ -OH	Polymethacrylic acid (PMA)	CH ₂ =CH(CH ₃)-C=O)O- (CH ₂) ₃ Si(OCH ₃) ₃	MMA
Synthesis Example 4	Zirconium(IV) propoxide [Zr(OCH ₂ CH ₃) ₄]	CF ₃ (CF ₂) ₇ CH ₂ CH ₂ -OH	Polymethacrylic acid (PMA)	CH ₂ =CH(CH ₃)-C=O)O- (CH ₂) ₃ Si(OCH ₃) ₃	MMA
Synthesis Example 5	Methyltriethoxy silane [CH ₃ Si(OCH ₂ CH ₃) ₃]	CF ₃ (CF ₂) ₇ CH ₂ CH ₂ -OH	Polymethacrylic acid (PMA)	CH ₂ =CH(CH ₃)-C=O)O- (CH ₂) ₃ Si(CH ₃) ₂ (OCH ₃)	MMA
Synthesis Example 6	TEOS [Si(OCH ₂ CH ₃) ₄]	CF ₃ (CF ₂) ₆ COOH	Polymethacrylic acid (PMA)	CH ₂ =CH(CH ₃)-C=O)O- (CH ₂) ₃ Si(OCH ₃) ₃	MMA
Synthesis Example 7	TEOS [Si(OCH ₂ CH ₃) ₄]	CF ₃ (CF ₂) ₇ SO ₃ H	Polymethacrylic acid (PMA)	CH ₂ =CH(CH ₃)-C=O)O- (CH ₂) ₃ Si(OCH ₃) ₃	MMA
Synthesis Example 8	TEOS [Si(OCH ₂ CH ₃) ₄]	CF ₃ (CF ₂) ₆ COOK	Polyacrylic acid (PA)	CH ₂ =CH(CH ₃)-C=O)O- (CH ₂) ₃ Si(OCH ₃) ₃	MMA
Synthesis Example 9	TEOS [Si(OCH ₂ CH ₃) ₄]	CF ₃ (CF ₂) ₇ CH ₂ CH(O)CH ₂	Polymethacrylic acid (PMA)	CH ₂ =CH(CH ₃)-C=O)O- (CH ₂) ₃ Si(OCH ₃) ₃	EMA

Table A'

	Preparative Example						Additional Preparative Example							
	1	2	3	4	5	6	7	8	9	10	11	12	13	
DMP	-	-	-	-	30	30	-	-	-	-	-	-	-	
Pure water	-	-	-	-	401.3	401.3	-	-	-	-	-	-	-	
LSH	-	-	-	-	3	3	-	-	-	-	-	-	-	
N-17	-	-	-	-	4.5	4.5	-	-	-	-	-	-	-	
HS-220	-	-	-	-	6	6	-	-	-	-	-	-	-	
LT-221	-	-	-	-	4.5	4.5	-	-	-	-	-	-	-	
APS	-	-	0.75	0.75	0.75	0.75	-	-	-	-	-	-	-	
Product 1	90	-	90	-	90	-	-	-	-	-	-	-	-	
Product 2	-	90	-	90	-	90	-	-	-	-	-	-	-	
Product 3	-	-	-	-	-	-	-	-	-	-	-	-	-	
Product 4	-	-	-	-	-	-	-	-	-	-	-	-	-	
Product 5	-	-	-	-	-	-	90	-	-	-	-	-	-	
Product 6	-	-	-	-	-	-	-	90	-	-	-	-	-	
Product 7	-	-	-	-	-	-	-	-	90	-	-	-	-	
Product 8	-	-	-	-	-	-	-	-	-	90	-	-	-	

Product 9	-	-	-	-	-	-	-	-	-	-	90	-	-
Product 10	-	-	-	-	-	-	-	-	-	-	-	90	-
Product 11	-	-	-	-	-	-	-	-	-	-	-	-	90
DMF	-	-	450	450	-	-	-	-	-	-	-	-	-
Methanol	450	450	-	-	-	-	450	450	450	450	450	450	450
Benzoin methyl Ether	0.75	0.75	-	-	-	-	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Methylene bis acrylamide	4	4	-	-	-	-	4	4	4	4	4	4	4

Table C'

		Example						Additional Example						
		1	2	3	4	5	6	7	8	9	10	11	12	13
Before cleaning	Water repellency	50	50	50	50	50	50	50	50	50	50	50	50	50
	Oil repellency	3	3	3	3	3	3	3	3	3	3	3	3	3
	SB property	10	10	10	10	10	10	10	10	10	10	10	10	10
	Soil releasability (%)	80	80	77	77	77	77	77	77	74	80	80	80	77
After cleaning (five times cleaning)	Water repellency	50	50	50	50	50	50	50	50	50	50	50	50	50
	Oil repellency	3	3	3	3	3	3	3	3	3	3	3	3	3
	SB property	10	10	10	10	10	10	10	10	10	10	10	10	10
	Soil releasability (%)	77	77	74	74	74	74	74	74	71	77	77	74	74
	Fluorine residual ratio (%)	95	95	95	95	95	95	95	95	95	95	95	90	95
Knoop hardness		33	33	30	30	28	28	30	30	28	33	33	33	30

With respect to the Examiner's view that increased oil and water repellency is expected with introduction of a fluorosilane, Applicants respectfully submit that the point to be made here is that it is the combination of the metal alkoxide (A) and a specific fluorine-containing compound (B) containing a functional group reactive with the metal alkoxide that unexpectedly provides enhanced properties as compared to those samples containing compound (B) but no metal alkoxide.

In view of the above, reconsideration and allowance of claims 2-4 and 6-11 are now believed to be in order, and such actions are hereby solicited.

If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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